

KNEE PAD & METHOD OF MANUFACTURE

BACKGROUND OF INVENTION

Knee pads are commonly used in the construction industry by workers who are required to kneel when performing their tasks. Such knee pads are usually made from a single sheet of pliable material such as leather or rubber sold under the trademark Neolite. The knee pad has an open side and an elbow section joined to a leg section to form a corner. The user places the open side over his or her knee and lodges the knee into the corner. A strap extends across opposed sides or edges of the leg section that enables the user to secure the knee pad in position to press the interior of the knee pad against the knee. The inside of the knee pad is lined with a sheet of foam rubber or felt.

One problem with conventional knee pads is that they don't fit comfortably on the user's knee when the user stands and walks around. As depicted in Figs. 1 and 2, the outer edges of the front walls of the elbow and leg sections of a conventional knee pad are straight and at a right angle to sides of these sections or bowed outward. It would be advantageous to make these conventional knee pads more comfortable, especially when the user is standing or walking. Another problem is that the conventional knee pads tend to move sideways as the user walks. This is due to the generally rounded cross-sectional shape of the leg section that results from the knee pad being made from a single sheet of the pliable material.

SUMMARY OF INVENTION

This invention has several features, no single one of which is

1 solely responsible for its desirable attributes. Without limiting the
2 scope of this invention as expressed by the claims that follow, its more
3 prominent features will now be discussed briefly. After considering
4 this discussion, and particularly after reading the section entitled,
5 "DETAILED DESCRIPTION," one will understand how the features of this
6 invention provide its benefits, which include, but are not limited to, a
7 more comfortable knee pad and a knee pad that does not easily move
8 sideways when being worn.

9 The first feature of the knee pad of this invention is that it
10 includes a body having an open side, an elbow section and a leg
11 section, with the elbow section and the leg section joined to form a
12 corner. The elbow section and leg section each have opposed side walls
13 connected by a front wall, and the elbow section and leg section are of
14 different lengths. The length of the elbow section is substantially
15 shorter than the length of the leg section. A strap member attached to
16 the leg section extends between the opposed side walls of the leg
17 section.

18 The second feature is that the opposed side walls of the elbow
19 section each have an outer side edge and the front wall of the elbow
20 section has an outer edge that extends between the outer side edges of
21 the opposed side walls of the elbow section. The opposed side walls of
22 the leg section each have an outer side edge and the front wall of the
23 leg section has an outer edge that extends between the outer side edges
24 of the opposed side walls of the leg section. The front walls of the
25 elbow section and the leg section are of substantially the same width
26 and each have a central longitudinal axis. These longitudinal axes
27 intersect to form an angle from about 90 to about 100 degrees.

28 In accordance with the third, and most important feature of this
29 invention, the outer edges of the front walls of the elbow section and

1 the leg section are each inwardly contoured forming a concave
2 indentation in the front walls of the elbow section and the leg section.
3 The concave indentation in the elbow section's front wall has a zenith
4 at the central longitudinal axis of said elbow section front wall, and the
5 concave indentation in the leg section's front wall has a zenith at the
6 central longitudinal axis of the leg section's front wall. The opposed
7 side walls of the leg section each have substantially the same width
8 and, preferably, the distance between the corner and the zenith of the
9 concave indentation in the elbow section's front wall is substantially
10 equal to the width of opposed side walls of the leg section. Each
11 concave indentation has a depth of from 1 to 2 inches, and preferably
12 the depth of each concave indentation is substantially the same. The
13 concave indentations preferably have substantially the same shape
14 such as sections of a circle. Preferably, the concave indentations are
15 mirror images.

16 In accordance with the fourth, and important feature of a second
17 embodiment of this invention, the body of the knee pad is formed from
18 a plurality of separate segments made of durable, pliable sheet
19 material. At least some of these segments have edges that overlap, with
20 the overlapping edges joined by at least one connector. These
21 segments include a pair side segments, a front segment, and an elbow
22 segment. The side segments are substantially at a right angle to the
23 front segment when the strap member secures the knee pad to the
24 user's knee. The side segments preferably are substantially
25 rectangular. The knee pad has a predetermined width and the elbow
26 segment has a width that is substantially wider than the predetermined
27 width of the knee pad to provide outer connector portions that are
28 bent inward to overlap portions of the side segments. The outer
29 connector portions have at least one connector attaching each of the

1 outer connector portions to one side segment. The front walls of the
2 elbow section and the leg section side walls when formed using
3 separate segments each have central longitudinal axis that intersect at
4 substantially at 90 degrees with respect to each other. Also, the side
5 walls of the elbow section substantially at 90 degrees with respect to
6 the front wall of the elbow section, and the side walls of the leg section
7 substantially at 90 degrees with respect to the front wall of the leg
8 section.

9 The fifth feature of this invention is that the knee pad has a
10 width of from about 4.25 to about 5.25, a length of from about 5.5 to
11 about 8 inches, and the opposed side walls of the leg section have
12 equal widths of from about 1.5 to about 2.5 inches. The elbow section
13 has a length of from about 1.5 to about 4.5 inches with opposed
14 rounded corners that project outwardly from the side walls of the leg
15 section. These opposed rounded corners each have a height of from
16 about 3 to about 4 inches measured from the front wall of the leg
17 section.

18 The sixth feature is that the

19 This invention also includes a method of making a knee pad.
20 This method includes:

21 (a) providing a plurality of separate segments each made of a
22 durable, pliable sheet material and each having side edges,

23 (b) forming said segments into said knee pad by overlapping and
24 connecting portions of the segments along their side edges, including
25 bending said connected portions inward to provide said knee pad with
26 a body having an open side, an elbow section and a leg section, said leg
27 section having side walls formed from at least a pair of said segments
28 connected to another segment forming a front wall of the leg section,

29 said pair of segments being substantially at a right angle to the

1 segment forming the front wall of the leg section.

2 In this method the outer edge of the front section and the outer
3 edge of the elbow section may each be inwardly contoured to form
4 concave indentations in these edges. Preferably, these concave
5 indentations are formed by cutting the segments along outer edges
6 corresponding to the outer edges of the front and sections prior to
7 connecting the segments together.

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9 DESCRIPTION OF DRAWINGS

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The preferred embodiments of this invention, illustrating all its features, will now be discussed in detail. These embodiments depict the novel and non-obvious knee pad of this invention and its method of manufacture as shown in the accompanying drawings, which are for illustrative purposes only. These drawings includes the following figures (Figs.), with like numerals indicating like parts:

Fig. 1 is a side elevational view of a prior art knee pad being worn by a user.

Fig. 2 is a front elevational view of the prior art knee pad shown in Fig. 1 being worn by a user.

Fig. 3 is a side elevational view of the first embodiment of the knee pad of this invention being worn by a user.

Fig. 4 is a front elevational view of the knee pad of this invention shown in Fig. 3 being worn by a user.

Fig. 5 is a top plan view of the knee pad of this invention shown in Fig. 3.

Fig. 6 is a side elevational view of the knee pad of this invention taken along line 6-6 of Fig. 5.

Fig. 7 is a front elevational view of the knee pad of this invention taken along line 7-7 of Fig. 5.

Fig. 8 is a side elevational view of the knee pad of this invention taken along line 8-8 of Fig. 5.

Fig. 9 is an elevational view of the backside of the knee pad of this invention taken along line 9-9 of Fig. 5.

Fig. 10 is a bottom plan view of the knee pad of this invention taken along line 10-10 of Fig. 9.

Fig. 11 is a plan view of the single sheet of material from which the knee pad of this invention shown in Figs. 3 through 10 is made.

Fig. 12 is a plan view of the three sheets of material from which the second embodiment of the knee pad of this invention shown in Figs. 13 through 18 is made.

Fig. 13 is a top plan view of the second embodiment of the knee pad of this invention.

Fig. 14 is a side elevational view of the knee pad of this invention taken along line 14-14 of Fig. 13.

Fig. 15 is a front elevational view of the knee pad of this invention taken along line 15-15 of Fig. 13.

Fig. 16 is a side elevational view of the knee pad of this invention taken along line 16-16 of Fig. 13.

Fig. 17 is an elevational view of the backside of the knee pad of this invention taken along line 17-17 of Fig. 13.

Fig. 18 is a bottom plan view of the knee pad of this invention taken along line 18-18 of Fig. 17.

DETAILED DESCRIPTION

First Embodiment

1
2 The first embodiment of this invention, the knee pad 10 shown in
3 Figs 3 through 10, is made from a single sheet 12 (Fig. 11) of durable,
4 pliable sheet material such as leather or rubber. The sheet material 12
5 has a thickness of about 1/8 inch, and it is slit along the lines 14 and
6 16 to form an upper portion A and a lower portion B, defining
7 marginal portions 14a, 14b, 16a, 16b may be bent inward to form, as
8 depicted in Figs. 3 through 10, a body 18 having an open side 20, an
9 elbow section 22 and a leg section 24. The elbow section 22 has a
10 length of about 3 inches, and the leg section 24 has a length of about 7
11 inches in this embodiment. Consequently, the length of the elbow
12 section 22 is substantially shorter than the length of the leg section 24.
13 As best shown in Figs. 9 and 10, the interior of the knee pad 10 is
14 covered with liner material 26 of foam or felt having a uniform
15 thickness, made of one or more plies, ranging from about 1/8 to about
16 1 inch.

17 The elbow section 22 and a leg section 24 are integral and are
18 formed by folding the upper portion A and lower portion B along the
19 line 28 (Fig. 11) of the sheet 12 to form a corner 30. The elbow section
20 22 is formed by folding the opposed marginal portions 14b and 16b of
21 the upper portion A inward along the lines 28c and 28d. The leg
22 section 24 is formed by folding the opposed marginal portions 14a and
23 16a of the lower portion B inward along the lines 28a and 28b. This
24 creates side walls and front walls, with the elbow section 22 having
25 opposed side walls 22a and 22b and leg section 24 having opposed side
26 walls 24a and 24b. The opposed side walls 22a and 22b are connected
27 by a front wall 22c and the opposed side walls 24a and 24b are
28 connected by a front wall 24. The front wall 22c of the elbow section
29 22 and the front wall 24c of the leg section 24 are of substantially the

1 same width, which is from about 4.50 in this embodiment. Each have a
2 central longitudinal axis X1 and X2, respectively, and these
3 longitudinal axes intersect to form an angle from about 90 to 100
4 degrees.

5 Because the single sheet 12 is used to make the knee pad 10, the
6 side walls 24a and 24b are integral with the front wall 24c of the leg
7 section 24. These side walls 24a and 24b are of equal heights of about
8 7 inches. A strap 32 extends between the side walls 24a and 24b that
9 includes a buckle 32a. The user secures the knee pad 10 to his or her
10 leg by first unbuckling the buckle 32a, then placing the knee pad over
11 his or her knee with knee lodged in the corner 30 as depicted in Fig. 3.
12 The user then buckles the strap 32 to hold the knee pad 10 with the
13 liner material 26 pressed snug against the user's knee. Other types of
14 straps may be employed using for example a hook and fabric connector
15 such as Velcro or the buckle could be eliminated and the strap made of
16 a continuous strip of elastic.

17 The opposed marginal portions 14b and 16b of the front wall 22c
18 of the elbow section 22 form the side walls 22a and 22b, respectively.
19 Because the single sheet 12 is used to make the knee pad 10, the side
20 walls 22a and 22b are integral with the elbow section's front wall 22c.
21 The distance between the opposed outer extremities 34 and 36 of the
22 upper portion A is substantially greater than the width of the knee pad
23 10, which is from about 4.50. These outer extremities 34 and 36 of the
24 upper portion A provide outer connector portions of the elbow section
25 22 that are folded inward along the lines 28c and 28d to overlap with
26 each side wall 24a and 24b of the leg section 24.

27 There are rivets 38 projecting through the overlapping portions
28 to connect each side wall 22a and 22b of the elbow section 22 to one
29 side wall 24a and 24b of the leg section 24. Rivets 38 also secure the

1 liner material 26 to the interior of the knee pad. The outer extremities
2 34 and 36 of the side walls 22a and 22b of the elbow section 22 each
3 include rounded, outer corners C1 and C2. These corners C1 and C2
4 are respectively folded over each of the side walls 24a and 24b of the
5 leg section 24 and project outwardly from each of these side walls 24a
6 and 24ba distance of about 1 inch. These opposed rounded corners C1
7 and C2 each have a maximum height of from about 2.5 to about 4
8 inches, typically 3 inches measured from the front wall 24c of the leg
9 section 24.

10 In accordance with this invention, the front wall 22c of the elbow
11 section 22 and the front wall 24c of the leg section 24 each have an
12 outer edge E1 and E2 respectively. The outer edge E1 extends between
13 the rounded corners C1 and C2 of the elbow section 22, and the outer
14 edge E2 extends between the side walls 24a and 24b of the leg section
15 24. Each of these outer edges E1 and E2 is inwardly contoured
16 forming therein concave indentations 40 and 42, respectively. Each
17 concave indentation 40 and 42 has a depth D of from 1 to 2 inches.
18 Preferably the depth D of each concave indentation 40 and 42 is
19 substantially the same, and the concave indentations 40 and 42 have
20 substantially the same shape, being sections of a circle that are mirror
21 images of each other.

22 The concave indentation 40 in the elbow section's front wall 22c
23 has a zenith Z1 at the central longitudinal axis X1 of this front wall 22c,
24 and the concave indentation 42 in the leg section's front wall 24c has a
25 zenith Z2 at the central longitudinal axis X2 of this front wall 24. The
26 opposed side walls 24a and 24b of the leg section 24 each have
27 substantially the same width W. The distance T between the corner 30
28 and the zenith Z1 of the concave indentation 40 in the elbow section's
29 front wall 22c is substantially equal to the width W of opposed side

1 walls 24a and 24b of the leg section 24. In this embodiment, the width
2 of the opposed side walls 24a and 24b of the leg section 24 is about 2
3 inches.

4 In accordance with another feature of this invention, the liner
5 material 26 has one edge portion 26a extending outward from the edge
6 E1 of the front wall 22c of the elbow section 22 as best shown in Fig. 5,
7 another one edge portion 26b is set back from the edge E2 of the front
8 wall 24c of the leg section 24 as best shown in Fig. 9. Each of these
9 edge portions 26a and 26b have substantially the same shapes as the
10 concave indentations 40 and 42, respectively, to which they are
11 adjacent. The edge portion 26a extends outward from the edge E1 a
12 distance of from about 1/8 to about 1/2 inch. The set back of the edge
13 portion 26b from the edge E2 exposes an inside surface 90 of the front
14 wall 24c. The edge portion 26b is from about 1/8 to about 1/2 inch
15 from the edge E2. The positioning of the liner material 26 in this
16 manner improves the comfort of the knee pad 10 when being worn by
17 a user.

18 Because the knee pad 10 is made from a single sheet of pliable
19 material 12, its cross-sectional shape is curved prior to attaching to the
20 user's knee. In some cases this may be acceptable, but the second
21 embodiment discussed subsequently, avoids the problem of a knee pad
22 with such a curved cross-sectional shape moving when the user is
23 walking with the knee pad 10 secure to the user's knee.

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25 Second Embodiment

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27 The second embodiment of this invention, the knee pad 50
28 shown in Figs. 13 through 18, is similar to the first embodiment, the
29 knee pad 10, and the same numerals are used for common

1 components. Like the first embodiment, the knee pad 50 has an elbow
2 section 22 and a leg section 24 joined at a corner 30, and a strap 32
3 attached to the leg section to enable the user to secure the knee pad 50
4 to the user's knee. The front walls 22c and 24c of the elbow and leg
5 sections respectively have outer edges E1 and E2 that are inwardly
6 contoured forming thereat concave indentations 40 and 42,
7 respectively. Each concave indentation 40 and 42 has a depth D of
8 from 1 to 2 inches, preferably each indentation is of the same depth.
9 The concave indentations 40 and 42 have the same shape, being
10 sections of a circle that are mirror images of each other. The concave
11 indentation 40 in the elbow section's front wall 22c has a zenith at the
12 central longitudinal axis X1 of this front wall 22c, and the concave
13 indentation 42 in the leg section's front wall 24c has a zenith at the
14 central longitudinal axis X2 of this front wall 24.

15 The main difference between the first and second embodiments is
16 that the knee pad 50 is made from four separate segments 52, 53, 54,
17 and 55, each made of a durable, pliable sheet material such as leather.
18 The segment 52 is the elbow segment and it forms the elbow section
19 22. The segments 53 and 54 are the side segments and the segment
20 55 is the front segment. These segments 53, 54 and 55 form the leg
21 section 24. One of the advantages of using these separate segments 52,
22 53, 54, and 55 is that the side walls 22a and 22b of the elbow section
23 22 and the side walls 24a and 24b of the leg section 24 are orient
24 substantially at a right angle to the front walls 22c and 24c,
25 respectively. This minimizes sideways any movement of the knee pad
26 50 while being worn by a user.

27 The elbow segment 52 has opposed side edges, or outer
28 extremities 34 and 36, an inner edge E3, and an outer edge E1. The side
29 edges or the outer extremities 34 and 36 are spaced apart so that the

1 elbow segment is longer than the width (about 4 inches) of the knee
2 pad 50. It includes the concave indentation 40 between the outer
3 extremities 34 and 36 along the outer edge E1 of this elbow segment 52.
4 The elbow segment 52 has rounded, outer corners C1 and C2 at the
5 extremities 34 and 36, respectively. The side segment 53 has at a
6 forward end a marginal edge 53a, and the side segment 54 has at a
7 forward end a marginal edge 54a. Each side segment 53 and 54 an
8 inner edge 53b and 54b, respectively, and outer edge 53c and 54c,
9 respectively, and a rear end 53d and 54d, respectively. The front
10 segment 55 has opposed marginal edges 55a and 55b, inner marginal
11 edge 55c, and outer edge E2. The concave indentations 40 and 42 are
12 formed by cutting respectively the segment 52 and 55 along their
13 respective outer edges E1 and E2, preferably prior to connecting the
14 segments together.

15 The segments 52, 53, 54, and 55 are assembled and attached by
16 rivets 38 to form the knee pad 50 shown in Figs. 13 through 18. The
17 marginal edge 55a of the segment 55 is placed beneath an inside edge
18 53b of the segment 53 and aligned so that these edges are coextensive.
19 Rivets 38 are then inserted as a row 60 (Fig. 14) into these overlapping
20 edges 53b and 55a. The marginal edge 55b of the segment 55 is placed
21 beneath an inside edge 54b of the segment 54 and aligned so that these
22 edges are coextensive. Rivets 38 are also then inserted as a row 62 (Fig.
23 16) into these overlapping edges 55b and 54b. The marginal edge 55c
24 is centered with, and beneath, an edge E3 of the segment 52 and a row
25 64 (Fig. 13) of rivets 38 secure the segment 55 to the segment 52. The
26 segments 53 and 54 are then folded inward in the same direction
27 substantially at a right angle to form the side walls 24a and 24b and
28 the front wall 24c of the leg section 24. The corners C1 and C2 of
29 segment 52 are folded about the lines 58 and 60 to cover, respectively,

1 the marginal edges 53a and 54a. Rivets 38a and 38b secure the
2 overlapping corner C1 to the marginal edge 53a, and rivets 38c and
3 38d secure the overlapping corner C2 to the marginal edge 53a. This
4 forms the side walls 22a and 22b and the front wall 22c of the elbow
5 section 22. The liner material 26 is placed in position prior to riveting
6 the segments 52, 53, 54 and 55 together. The rivets 38 along the outer
7 edges of the knee pad 50, as well as the rivets holding the segments 52,
8 53, 54 and 55 together, retainer the liner material 26 in place.

9 With the segments 52, 53, 54 and 55 riveted together the body
10 18 of the knee pad 50 is formed having an open side 20, and the elbow
11 section 22 and the leg section 24 joined at the corner 30. The elbow
12 section's front wall 22c is at substantially 90° with respect to the front
13 wall 24c of the leg section 24. Moreover, the side walls 22a and 22b of
14 the elbow section 22 are at substantially 90° with respect to the front
15 wall 22c of the elbow section, and the side walls 24a and 24b of the leg
16 section 24 are also at substantially 90° with respect to the front wall
17 24c of the leg section. Consequently, the opposed side walls 24a and
18 24b do not gently curve outward as they do in of the knee pad 10, the
19 first embodiment.

20 With the strap 32 attached to extend between the side segments
21 53 and 54 and wrapped around the user's leg to secure the knee pad
22 50 in place covering the user's knee, the side segments 53 and 54 and
23 the central portion elbow segment 52 are substantially at a right angle
24 to the front segment 55. This creates a substantial right angle
25 relationship between the front wall 22c and 24c of the elbow and leg
26 segments and the substantial right angle relationship side walls 24a
27 and 24b and the front wall 24c of the leg section 24 that prevents
28 excessive sideways movement of the pad 50 during walking or
29 kneeling. Nevertheless, the indentations 40 and 42, in addition to

1 providing the desired comfort when walking with the knee pad 50
2 secured to the user's knee, assist in minimizing sideways movement of
3 the pad during walking or kneeling. It is counter-intuitive to make the
4 knee pad 50 from a plurality of separate segments 52, 53, 54 and 55
5 rather than from a single sheet, because of the added costs. But using
6 the manufacturing method of this invention where the separate
7 segments 52, 53, 54 and 55 are connected together avoids the problem
8 of movement of the pad during walking or kneeling.

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10 SCOPE OF THE INVENTION

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12 The above presents a description of the best mode contemplated
13 of carrying out the present invention, and of the manner and process
14 of making and using it, in such full, clear, concise, and exact terms as
15 to enable any person skilled in the art to which it pertains to make and
16 use this invention. This invention is, however, susceptible to
17 modifications and alternate constructions from that discussed above
18 which are fully equivalent. Consequently, it is not the intention to
19 limit this invention to the particular embodiments disclosed. On the
20 contrary, the intention is to cover all modifications and alternate
21 constructions coming within the spirit and scope of the invention as
22 generally expressed by the following claims, which particularly point
23 out and distinctly claim the subject matter of the invention: